Packaging Waste Reduction by Optimal Cardboard Box Selection

Kwon, Jimmy (School: BASIS Tucson North)

Nowadays, packaging waste is a prevalent issue due to the increase in deliveries from online shopping. In this research, a new approach to the issue of cardboard box packaging waste is proposed by selecting an optimal box that will contain both regular and irregular products while minimizing wasted volume. The method can be utilized so that packaging workers can select an appropriate, sustainable box. For irregular objects, the system setup with two cameras is prepared to capture the overhead and sideview images, estimating the box's width, depth, and height in pixels. The traditional Otsu's thresholding method, proposed Otsu's scheme, and 1-D gradient means are utilized to avoid inaccuracies created by shadows. With the dimensions of the irregular product calculated and the dimensions of the regular product given, the Largest Area First Fit (LAFF) algorithm is used to optimally 3-D package both irregular and regular products together. By placing items with the biggest surface area first, the algorithm effectively stacks items while minimizing height and efficiently proposes an optimal box for a random set of items. Overall, this proposed method of choosing an optimal box size significantly reduces cardboard waste.

Awards Won:
Arizona State University: Arizona State University ISEF Scholarship (valued at up to $52,000 each)
University of Arizona: Renewal Tuition Scholarship